IS 10706 (1983): Methods of tests for single sideband PLC terminals [LITD 10: Power System Control and Associated Communications]

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Indian Standard

METHODS OF TESTS FOR SINGLE SIDEBAND PLC TERMINALS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

METHODS OF TESTS FOR SINGLE SIDEBAND PLC TERMINALS

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Indian Standard

METHODS OF TESTS FOR SINGLE SIDEBAND PLC TERMINALS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 August 1983, after the draft finalized by the Power Line Carrier Systems and Associated Telecontrol Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This standard covers methods of tests for single sideband PLC terminals. The characteristic values of inputs and outputs of these PLC terminals are covered by IS : 9482-1980*.

0.3 Certain information, which is to be furnished by the manufacturer, and is essential for testing of PLC terminals is given in Appendix A.

0.4 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960†.

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1. SCOPE

1.1 This standard covers methods of tests for single sideband (SSB) power line carrier (PLC) terminals conforming to IS : 9482-1980*.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions in addition to those given in IS : 9482-1980* shall apply.

2.1 Type Tests — Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of a given type of PLC terminal.

2.2 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

*Characteristic values of inputs and outputs of single sideband PLC terminals.
†Rules for rounding off numerical values (*revised*).

2.3 Routine Tests — Tests carried out on each PLC terminal to check requirements which are likely to vary during production.

3. GENERAL TEST CONDITIONS

3.1 The tests, routine, type and acceptance tests, may be carried out at the manufacturer's works. In case adequate test facilities are not available at the manufacturer's works, the tests may be carried out at another place where such test facilities may be available, as agreed between the manufacturer and the purchaser.

3.2 The routine and acceptance tests shall be carried out under the following conditions :

Temperature	15 to 35°C
Maximum rate of change of temperature	20°C/h
Relative humidity	45 to 75 percent
Maximum water content	30 g/m^3
Supply voltage :	
With battery operation	Nominal voltage
With ac mains operation	Nominal voltage at 50 Hz

NOTE 1 — The temperature range may be extended beyond these limits, say up to 10 to 40°C, by mutual agreement.

NOTE 2 — Where it is impracticable to carry out tests within the limits specified above, a note to this effect stating the actual conditions of tests, shall be added to the test report.

3.3 Type tests shall be carried out under the following conditions :

Temperature	a) 0°C
	b) as for routine tests
	c) 50°C
Maximum rate of change of temperature	20°C/h
Relative humidity	a) as for routine tests
	b) 95 percent, *Max*, non-condensing
Maximum water content	30 g/m^3
Supply voltage :	
i) With battery operation	a) Nominal −10 percent
	b) Nominal
	c) Nominal +15 percent

ii) With ac mains operation :

Voltage	a) Nominal — 15 percent b) Nominal c) Nominal +15 percent
Frequency	a) 45 Hz b) Nominal 50 Hz c) 53 Hz
Distortion factor	5 percent, *Max*

NOTE — Where it is impracticable to achieve 95 percent (non-condensing) relative humidity over temperature range 0 to 50°C, tests may be carried out at lower relative humidity and a note to this effect stating the actual conditions of tests shall be added to the test report.

3.4 For some of the tests, particular measuring methods are specified. It is permissible to use alternate methods, if they are equivalent.

3.5 A list of instruments suitable for testing PLC terminals, alongwith their broad specifications, is given in Appendix B.

3.6 A block diagram of a typical PLC terminal is shown in Fig. 1.

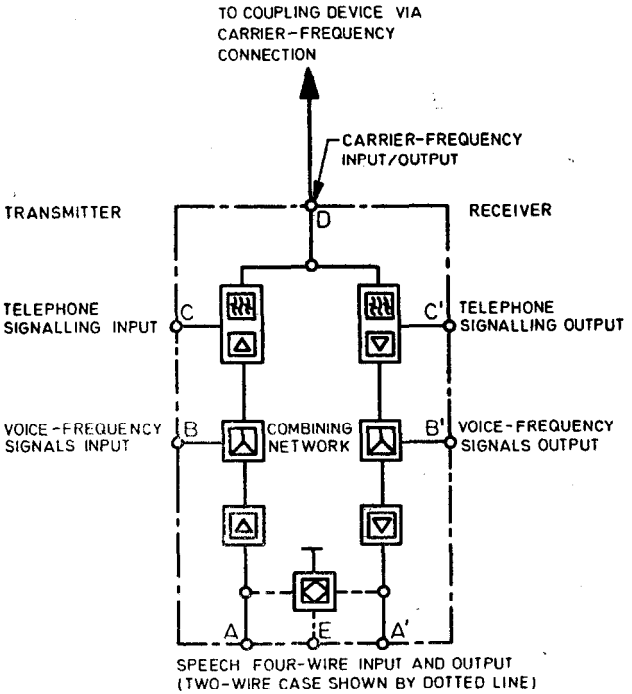


FIG. 1 BLOCK DIAGRAM OF A PLC TERMINAL SHOWING THE INPUTS AND OUTPUTS UNDER CONSIDERATION (VERIATIONS IN THE INTERNAL ARRANGEMENTS ARE POSSIBLE)

4. TESTS

4.1 The type, acceptance and routine tests shall be as given in **4.1.1**, **4.1.2** and **4.1.3** resdectively.

4.1.1 *Type Tests* — The schedule of type tests is given in Table 1.

4.1.1.1 *Samples for type tests* — The type tests shall be carried out on one pair of PLC terminals which shall pass all the type tests for conformity to the specification.

TABLE 1 SCHEDULE OF TYPE TESTS, ROUTINE TESTS AND ACCEPTANCE TESTS

(*Clauses* 4.1.1, 4.1.2, 4.1.3 *and* C-3.1)

TEST	CLAUSE REF TO IS : 9482-1980*	TYPE TEST	ROUTINE TEST	ACCEPTANCE TEST
(1)	(2)	(3)	(4)	(5)
Ambient temperature and humidity	3.1	×		
Supply voltage with battery operation	3.2	×		
Supply voltage with ac operation	3.3	×		
Storage condition	4.1	×		
Nominal impedance and return loss — carrier frequency side	5.2.2	×		
Spurious emissions	5.2.3	×		
Carrier-frequency levels	5.2.4	×	×	×
Frequency accuracy	5.2.5	×	×	×
Loss for speech — frequency level	5.3.1	×	×	×
Loss for signal — frequency level	5.3.2	×	×	×
Signal levels	5.3.4	×	×	×
Nominal impedance and return loss — voice frequency side	5.3.5	X		
Group delay distortion	5.3.6	×		
Automatic gain control	5.3.7	×	×	×
Transmit/receive frequency difference	5.3.8	×	×	×
Linearity	5.3.9	×		
Limitar action	5.3.10	×		
Noise generated within terminal	5.3.11	×		

(*Continued*)

TABLE 1 SCHEDULE OF TYPE TESTS, ROUTINE TESTS AND ACCEPTANCE TESTS — *Contd*

Test	Clause Ref to IS : 9482-1980*	Type Test	Routine Test	Acceptance Test
(1)	(2)	(3)	(4)	(5)
Near-end and far-end cross talk	5.3.12	×		
Cross talk attenuation	5.3.13	×		
Pulse distortion	5.4.2	×		
Voltage withstand test on dc power supply unit	6.1.1	×	×	×
Voltage withstand test on ac power supply unit	6.1 2	×	×	×
Carrier-frequency input/ output terminals — voltage withstand	6.2	×	×	×
Voice frequency, signalling and alarm circuits — voltage withstand	6.3	×	×	×

*Characteristic values of inputs and outputs of single sideband PLC terminals.

Note 1 — The symbol ' × ' denotes that a particular test is to be carried out.

Note 2 — Impulse voltage test for **6.1.1** and **6.2** is type test only.

Note 3 — The acceptance tests may be carried out at any voltage between the lower and upper limit of the nominal supply voltage of the PLC terminal.

4.1.2 *Acceptance Tests* — The schedule of acceptance tests is given in Table 1.

4.1.2.1 *Samlping plan* — A recommended sampling plan for acceptance tests is given in Appendix C.

4.1.3 *Routine Tests* — The schedule of routine tests is given in Table 1.

5. TESTS FOR STORAGE CONDITIONS

5.1 For testing the PLC terminals for storage conditions, the terminals may be stored at following temperature, humidity and time periods :

Temperature	a) — 25°C b) + 65°C
Maximum rate of change of temperature	20°C/h
Relative humidity	95 percent, *Max*, non-condensing
Maximum water content	30 g/m^3
Duration of storage	a) 16 h at — 25°C b) 16 h at + 65°C

NOTE 1 — Where it is impracticable to carry out storage at the limit of relative humidity specified above, a note to this effect stating the actual storage conditions shall be added to the test report.

NOTE 2 — In case equipment is transported by air, the above maximum rate of change of temperature does not apply.

6. TESTS FOR CHARACTERISTIC VALUES OF INPUTS AND OUTPUTS OF SINGLE SIDEBAND PLC TERMINALS

6.1 Carrier-Frequency (C-F) Side

6.1.1 *Nominal Impedance and Return Loss* (*see also* **5.2.2** of IS : 9482-1980*) — Measurement of the return loss shall be carried out at several frequencies within the nominal carrier-frequency band in the transmit direction. Figure 2A shows a typical method of measuring the return loss of PLC terminals with unbalanced carrier-frequency output. Figure 2B shows a typical method of measuring the return loss of PLC terminals with balanced carrier frequency output.

Return loss A is given by the formula:

$$A = 20 \log_{10} \frac{V'}{V''} \text{ (dB)}$$

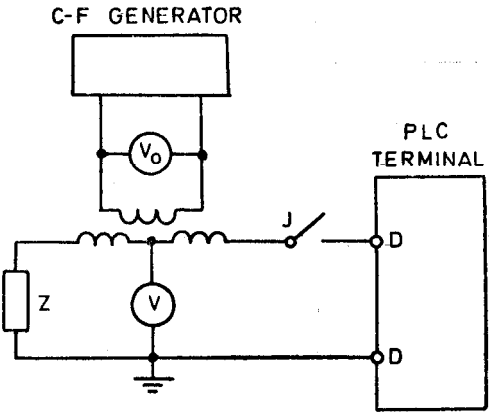
where V' and V'' are the voltages measured by voltmeter V with switch J in the ' on ' and ' off ' positions respectively, the generator voltage V_0 being kept equal in both switch positions.

6.1.2 *Spurious Emissions* (*See also* **5.2.3** of IS : 9482-1980*) — Fig. 3 shows a typical method of measurement of spurious emissions. The levels shall be tested at carrier-frequency output points by terminating with a suitably rated resistive load equal to the nominal impedance. The measurement shall be made with the aid of selective measuring set with an effective bandwidth not exceeding 300 Hz. It is necessary to ensure that the limiting action of the limiter does not occur when making this measurement.

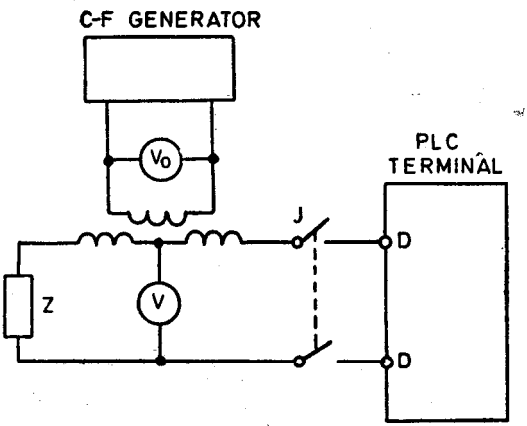
6.1.3 *Carrier-Frequency Levels* (*See also* **5.2.4** of IS : 9482-1980*) — The carrier-frequency levels of speech and signals shall be measured at carrier-frequency output points by terminating with a suitably rated resistive load equal to the nominal impedance. The measurement shall be made with the aid of a selective level measuring set with an effective bandwidth not exceeding 300 Hz.

6.1.4 *Frequency Accuracy* (*See also* **5.2.5** of IS : 9482-1980*) — The frequencies of carrier-frequency transmitter and receiver oscillators shall be measured with the aid of a frequency counter readable up to 0·1 Hz.

*Characteristic values of inputs and outputs of single sideband PLC terminals.



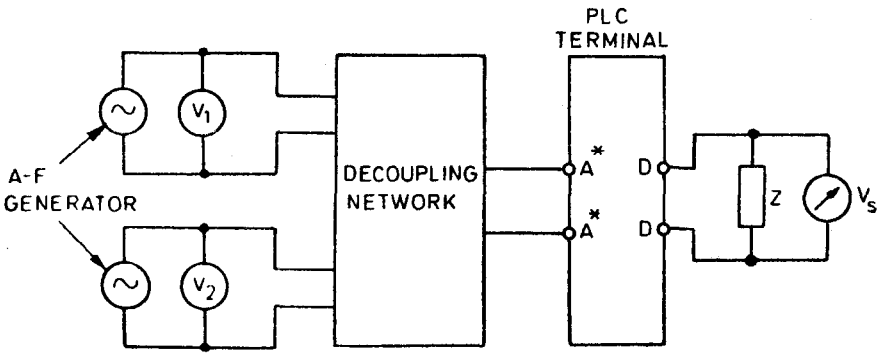
2A Measurement of Return Loss of PLC Terminal with Unbalanced Carrier-Frequency Output



2B Measurement of Return Loss of PLC Terminal with Balanced Carrier Frequency Output

$\mathcal{J}$ = Switch
V_0, V = High impedance voltmeters
$\mathcal{Z}$ = Resistor having resistance equal to nominal impedance at carrier frequency

FIG. 2 MEASUREMENT OF RETURN LOSS



V_1, V_2 = High impedance voltmeters
V_S = High impedance selective c-f level meter
Z = Resistance load equal to the nominal impedance at carrier frequency output

*Audio frequency signals may be applied at input points A (four-wire speech input for PLC terminals for speech only. In the case of PLC terminals for speech plus signals operation, the audio frequency signal may be applied at:

a) input points A (four-wired speech input),
b) input points B (v-f signals input)

FIG. 3 MEASUREMENT OF SPURIOUS EMISSIONS

6.2 Voice-Frequency (V-F) Side

6.2.1 *Loss for Speech Frequency Band* (*See also* **5.3.1** of IS : 9482-1980*) — A PLC terminal shall be tested in combination with an identical PLC terminal, however, with the receiver and transmitter frequencies interchanged. The two terminals shall be connected by means of a suitably rated variable attenuator equal to nominal impedance on carrier-frequency side. The attenuator shall be adjusted to a value that the carrier-frequency receive level is in the middle of the automatic gain contol of the PLC terminal. The test for permissible limits of 4-wire overall loss with respect to the reference value at 800 Hz shall be measured at points A and A' of Fig. 1. VF level oscillator and V-F level meter may by used for measurements.

6.2.2 *Overall Loss of Signal-Frequency Band* (*See also* **5.3.2** of IS : 9482-1980*) — The measuring set-up shall be the same as given in **6.2.1**. The overall loss of the effectively transmitted signal-frequency band shall be measured at points B and B' of Fig. 1.

*Characteristic values of inputs and outputs of single side band PLC terminals.

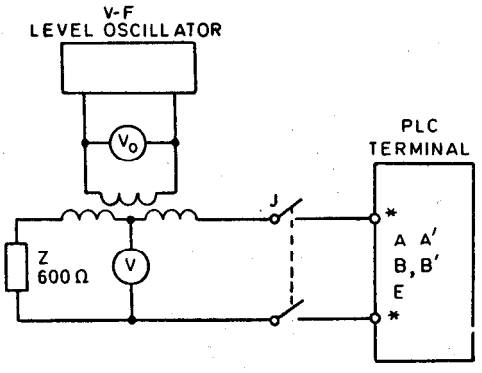
6.2.3 *Speech Levels* (*See also* **5.3.3** of IS : 9482-1980*) — The measuring set-up shall be the same as given in **6.2.1**. The relative 4-wire levels for speech shall be measured at points A and A' of Fig. 1. The relative 2-wire levels for speech shall be measured at points E of Fig. 1.

6.2.4 *Signal Levels* (*See also* **5.3.4** of IS : 9482-1980*) — The measuring set-up shall be the same as given in **6.2.1**. The absolute input and output levels for signal channels shall be measured at points B and B' of Fig. 1.

6.2.5 *Nominal Impedance and Return Loss* (*See also* **5.3.5** of IS : 9482-1980*) — Measurement of the return loss of speech and signal input and output circuits shall be made at several frequencies within the effectively transmitted speech frequency band and effectively transmitted signal frequency band respectively. Figure 4 shows a typical method of measuring the return loss. The return loss A is given by the formula :

$$A = 20 \text{ Log } \frac{V'}{V''} \text{ (dB)}$$

where V' and V'' are the voltages as measured by voltmeter V with switch J in the 'On' and 'Off' positions respectively, the generator voltage V_0 being kept equal in both switch positions.



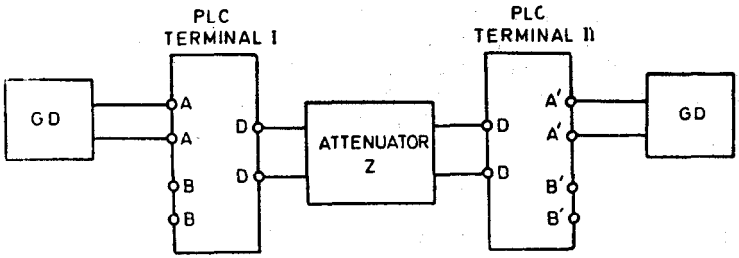
J = Switch
V_0, V = High Impedance voltmeters

*Input	Points	A	For Speech four-wire input
Input	,,	B	For Signals input
Output	,,	A'	Fot Speech four-wire output
Output	,,	B'	For Signals output
Input/Output	,,	E	For Speech two-wire input/output

FIG. 4 MEASUREMENT OF RETURN LOSS VOICE-FREQUENCY SIDE

*Characteristic values of inputs and outputs of single side band PLC terminals.

6.2.6 *Group-Delay Distortion* (*See also* **5.3.6** of IS : 9482-1980*) — Figure 5 shows a typical method of measuring group-delay distortion. The group-delay distortion for effectively transmitted signal frequency band shall be measured at points *B* and *B'* of Fig. 1. The group delay distortion for speech channel shall be measured at points *A* and *A'* when speech channel is used for part of the time for data transmission. The limits of group delay distortion are subject to agreement between the manufacturer and the purchaser. However, suggested limits are given in Fig. 5A and 5B of IS : 9482-1980*.



Z = Nominal impedance at carrier-frequency output
GD= Group delay meausurement set

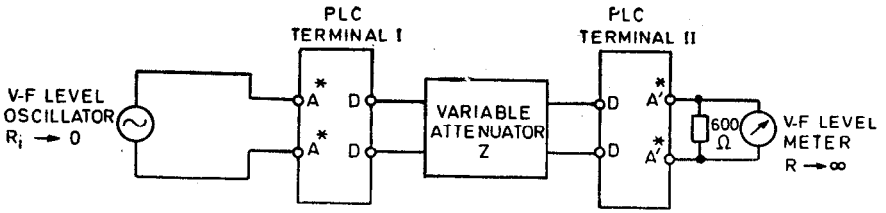
FIG. 5 MEASUREMENT OF GROUP-DELAY DISTORTION

6.2.7 *Automatic Gain Control (AGC)* (*See also* **5.3.7** of IS : 9482-1980*)— Figure 6 shows a typical method of measuring automatic gain control. The attenuator shall be adjusted to bring the carrier-frequency receive level in the centre of automatic gain control range. For measurement of automatic gain control (AGC), the attenuator shall be varied by at least ± 15 dB from the centre of AGC range so that at least 30 dB change in the carrier-frequency signal level within the regulation range is achieved.

6.2.8 *Transmit/Receive Frequency Difference* (*See also* **5.3.8** of IS : 9482-1980*) — The measuring set-up as given in **6.2.7** for measurement of AGC may be used for this measurement. The frequencies of the transmit and receive voice frequency signal may be measured by a frequency counter to read up to 0·1 Hz.

6.2.9 *Linearity* (*See also* **5.3.9** of IS : 9482-1980*) — Measuring set-up as shown in Fig. 6 for measurement of AGC may be used for linearity measurement. The measurements shall be made at points *A* and *A'* of Fig. 1. Input level between — 10 dBmO and O dBmO shall be applied at point *A* of Fig. 1.

*Characteristic values of inputs and outputs of single sideband PLC terminals.



$\mathcal{Z}$ = Nominal impedance at carrier-frequency output

NOTE 1 — Automatic gain control shall be measured for PLC terminals for speech only between Points *A* of PLC Terminal I and Points *A'* of PLC Terminal II.

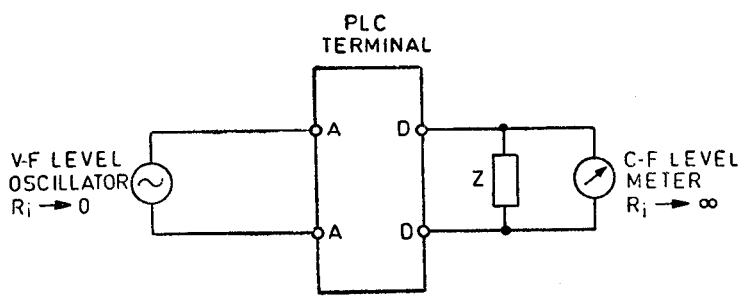
NOTE 2 — Automatic gain control shall be measured for PLC terminals for speech plus signals operation between following points:

a) Points *A* of PLC Terminal I, and Points *A'* of PLC Terminal II.

b) Points *B* of PLC Terminal I, and Points *B'* of PLC Terminal II.

FIG. 6 MEASUREMENT OF AUTOMATIC GAIN CONTROL

6.2.10 *Limiter Action* (*See also* **5.3.10** of IS : 9482-1980*)—Figure 7 shows a typical method of measurement of limiter action. The action of the limiter shall be measured for any sine-wave signal of a frequency between 300 Hz and upper frequency of the speech channel and shall be applied at point *A* of Fig. 1. The level of the carrier-frequency output signal shall be measured at point *D* of Fig. 1, the transmitter being terminated with a suitably rated resistive load equal to the nominal impedance. For measurement of the limiter action, the VF input signal shall be varied from —10 dBmO to +15 dBmO.

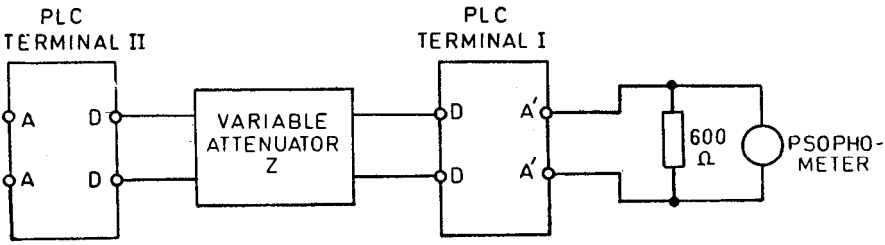


$\mathcal{Z}$ = Resistive load equal to the nominal impedance at carrier-frequency output

FIG. 7 MEASUREMENT OF LIMITER ACTION

*Characteristic values of inputs and outputs of single sideband PLC terminals.

6.2.11 *Noise Generated Within the Terminals* (*See also* **5.3.11** of IS : 9482-1980*) — Figure 8 shows a typical method of measurement. The weighted telephone noise level shall be measured at the speech output (point *A'* of Fig. 1). The measurement shall be made in the absence of any signal transmission with the attenuator inserted between the carrier-frequency input/output terminals set to a value equal, in dB, to the nominal carrier-frequency output level in dBm.



Z = Nominal impedance at carrier frequency output

NOTE — Value of attenuator inserted between the c-f input and output points shall be to a value equal, in dB, to the nominal c-f output level in dBm.

FIG. 8 MEASUREMENT OF NOISE GENERATED WITHIN THE PLC TERMINAL

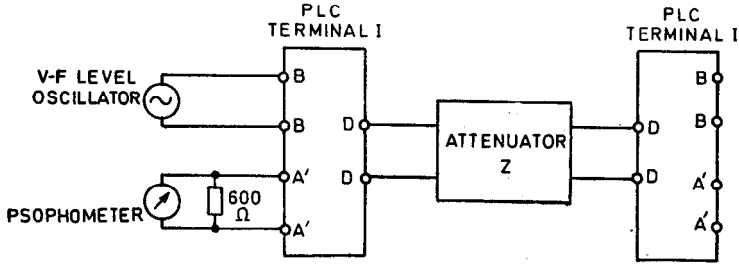
6.2.12 *Near-End and Far-End Crosstalk* (*See also* **5.3.12** of IS : 9482-1980*) — Method of measurement of near-end and far-end crosstalk is shown in Fig. 9A and 9B. Tbe attenuator is to be inserted as for measurement of noise generated within the terminals.

6.2.13 *Crosstalk Attenuation* (*See also* **5.3.13** of IS : 9482-1980*) — Figure 10A and 10B show a typical method of measurement of crosstalk attenuation. The tests shall be made at a pair of such PLC terminals with a single sinusoidal voice frequency signal allocated within the effectively transmitted frequency points at a level not exceeding O dBmO in the absence of any other signal transmission.

7. TESTS ON TELEPHONE SIGNALLING CHANNEL

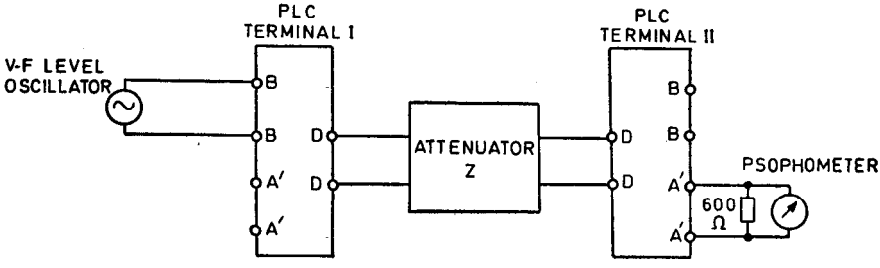
7.1 False Distortion (*See also* **5.4.2** of IS : 9482-1980*) Figure 11 shows a typical method of measurement of pulse distortion. The distortion generator shall be set for a mark-to-space ratio of 40/60 or $33\frac{1}{3}/66\frac{2}{3}$ with signalling speed of ten pulses per second.

*Characteristic values of inputs and outputs of single sideband PLC terminals.



Z = Nominal impedance at carrier-frequency output

9A Measurement of Near-End Cross-Talk



Z = Nominal impedance at carrier-frequency output

9B Measurement of Far-End Cross-Talk

FIG. 9 MEASUREMENT OF CROSS-TALK

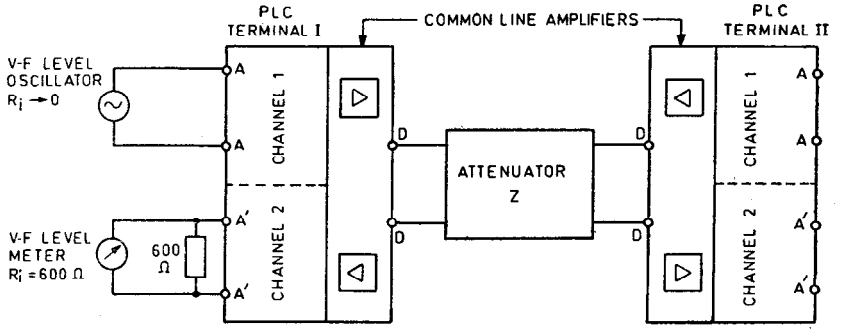
8. TESTS FOR VOLTAGE WITHSTAND REQUIREMENTS

8.1 Battery Operated PLC Terminals (*See also* **6.1.1** of IS : 9482-1980*) — When the dc power supply terminals are both isolated from earth, 500 V dc shall be applied for 1 minute between both terminals connected together and earth. The power supply shall withstand the test without damage. When the dc power supply terminals are not isolated from earth, impulse voltage of 1 000 V 1·2/50 μs shall be applied between each terminal and earth in accordance with IS : 2071†. The power supply shall be capable of withstanding the tests. Figure 12 shows a method of performing the impulse voltage tests.

8.2 AC Mains Operated PLC Terminals (*See also* **6.1.2** of IS : 9482-1980*) — A voltage of 2 000 V rms at power frequency shall be applied for 1 minute between both terminals connected together and earth. The power supply shall be capable of withstanding the test without damage.

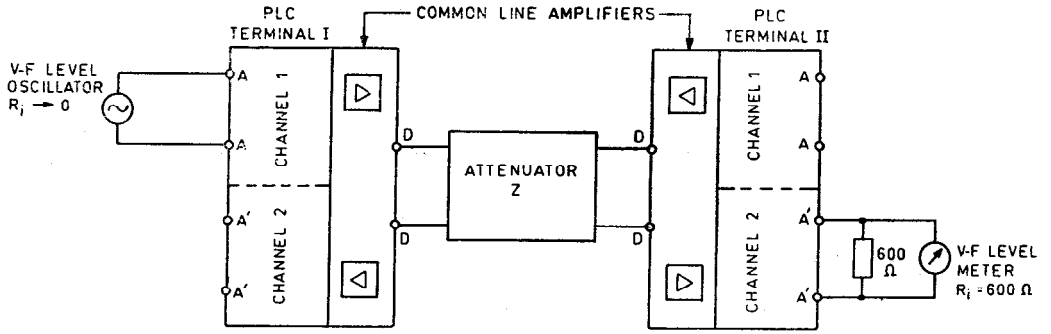
*Characteristic values of inputs and outputs of single sideband PLC terminals.

†Methods of high voltage testing (*first revision*).



$\mathcal{Z}$ = Nominal impedance at carrier-frequency output

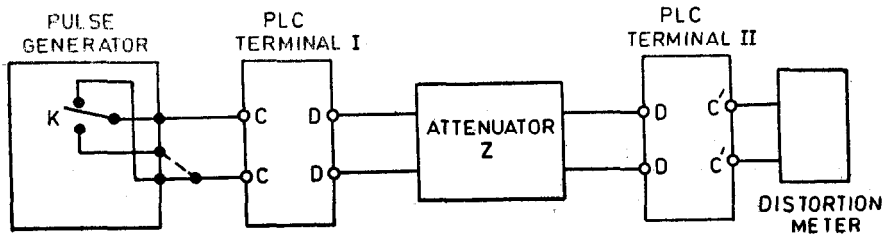
10A Near-End Cross Talk Attenuation



$\mathcal{Z}$ = Nominal impedance at carrier-frequency output

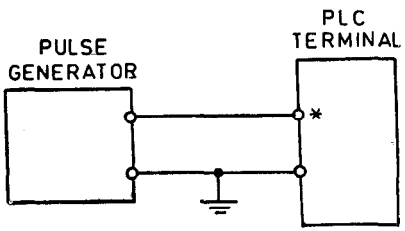
10B Far-End Cross Talk Attenuation

FIG. 10 MEASUREMENT OF CROSS TALK ATTENUATION BETWEEN INDIVIDUAL CHANNELS SHARING COMMON CARRIER FREQUENCY EQUIPMENT (FOR EXAMPLE COMMON LINE AMPLIFIER)



Z = Nominal impedance at carrier frequency output
K = NO or NC contact of pulse generator

FIG. 11 MEASUREMENT OF PULSE DISTORTION



*Test points are:

1) Power supply point (when not isolated from earth)
2) Carrier-frequency input and output terminals (when not isolated from earth)

FIG. 12 IMPULSE VOLTAGE TEST

8.3 Carrier-Frequency Input and Output Terminals (*See also* **6.2** of IS : 9482-1980*) — When the carrier-frequency terminals are isolated from earth, a test voltage of 2 000 V rms at power frequency shall be applied for 1 minute between both terminals connected together and earthed. The equipment shall be capable of withstanding the test without damage. When the carrier-frequency terminals are not isolated from the earth, an impulse voltage of 3 000V 1·2/50 μs shall be applied between each terminal and earth in accordance with IS : 2071†. The equipment shall be capable of withstanding the test without damage.

8.4 Voice-Frequency, Signalling and Alarm Circuits (*See also* **6.3** of IS : 9482-1980*) — When voice-frequency, signalling and alarm circuits are free from earth, a test voltage of 500 V dc shall be applied for 1 minute between the terminals of the circuit connected together and earth. The circuits shall be capable of withstanding the tests without damage.

*Characteristic values of inputs and outputs of single sideband PLC terminals.
†Methods of high voltage testing (*first revision*).

APPENDIX A

(*Clause* 0.3)

INFORMATION TO BE FURNISHED BY MANUFACTURER SOME OF WHICH IS SUBJECT TO AGREEMENT BETWEEN THE MANUFACTURER AND THE PURCHASER

	*Ref to Clause in IS : 9482-1980**
Service Conditions	
Nominal supply voltage for battery operation	**3.2**
Nominal supply voltage for ac mains operation	**3.3**
Carrier Frequency Side Requirements	
Range of carrier frequencies	**5.2.1**
Nominal impedance	**5.2.2**
Carrier frequency levels	**5.2.4**
Voice Frequency Side Requirements	
Speech-frequency band	**5.3.1**
Signal-frequency band	**5.3.2**
Voice Frequency Side Requirements	
Speech levels	**5.3.3**
Signal levels	**5.3.4**
Telephone Signalling Channel	
Modulation and frequency band	**5.4.1**
Voltage Withstand Requirements	
Power supply : Whether or not isolated from earth	**6.1.1** or **6.1.2**
Carrier frequency input/output terminals : Whether or not isolated from earth	**6.2**

*Characteristic values of inputs and outputs of single sideband PLC terminals.

APPENDIX B

(*Clause* 3.5)

LIST OF INSTRUMENTS SUITABLE FOR TESTING PLC TERMINALS

B-1. C-F TRANSMISSION MEASURING SET (TRANSMITTER AND RECEIVER)

B-1.1 Applications

a) Measurement of levels, attenuations, amplifications, impedance in the h. f. range from approximately 10 kHz to 600 kHz.

b) Transmitting of standard levels.

c) Noise measurements.

B-1.2 Specifications

B-1.2.1 *Transmitter*

a) Frequency : Continuous adjustment f=10 kHz to 600 kHz
Fine adjustment f = ± 5 kHz

b) Output impedance (switchable) : 75, 100, 150, 600 ohms.
O(<3) ohm symmetrical

c) Output level : −60 to +20 dBm in steps
Fine adjustment : 20 dB continuous

B-1.2.2 *Receiver*

a) Frequency range : 10 kHz to 600 kHz

b) Measuring range, wideband : −60 dBm to +40 dBm

c) Measuring range, selective : −80 dBm to +40 dBm

d) Bandwidth for selective measurements (3 dB) : $f_x \pm 40$ Hz

e) Stopband attenuation : 60 dB at $f_x \pm 300$ Hz

f) Non-linear distortion attenuation : >70 dB

g) Input impedance (switchable) : 75, 100, 150, 600, 6 000 Ohm symmetrical

h) Measuring error : ± 0·2 dB

B-2. V-F TRANSMISSION MEASURING SET (TRANSMITTER AND RECEIVER)

B-2.1 Applications

a) Measurement of levels, attenuations, amplifications, and impedances in the v. f. range from 300 Hz to 4 000 Hz — Wide band, Selective, Psophometric

b) Transmitting of standard levels

B-2.2 Specifications

B-2.2.1 *Transmitter*

a) Frequency :	Continuous adjustment from 200 Hz to 4 000 Hz.
b) Output impedance (switchable) :	O (<6 Ohm) 600 ohms symmetrical
c) Output level :	−40 dBm to +10 dBm in steps
Fine adjustment :	15 dB continuous

B-2.2.2 *Receiver*

a) Frequency range :	200 Hz to 4 000 Hz
b) Measuring range, Wideband :	−70 dBm to +20 dBm
c) Input impedance (switchable) :	6 000 Ohm, 600 Ohm symmetrical
d) Measuring error .	+0·2 dB

B-3. PSOPHOMETER

B-3.1 Application

a) Objective measurements of unweighted and weighted noise voltage in the telephone channels

b) Psophometric weighting and rms indication*

B-3.2 Specifications

B-3.2.1 *Frequency Range*

a) Weighted noise voltage measurements switchable to : Telephoney—Filter†

b) Unweighted noise voltage measurement : 15 Hz to 20 kHz.

c) Level measurement : 15 Hz to 20 kHz

*According to OCITT recommendations.
†CCITT filter or external filter.

B-3.2.2 *Level*

a) 90 to + 40 dB
Suitable in 10 dB steps and 30 μV to 100 V
Smallest readable voltage weighted noise voltage mode :

b) 100 dB ; 10 μV

APPENDIX C

(*Clause* 4.1.2.1)

RECOMMENDED SAMPLING PLAN

C-1. LOT

C-1.1 In any consignment, all the PLC terminals of the same type, manufactured from the same materials under essentially similar conditions of production shall be grouped together to constitute a lot.

C-2. SCALE OF SAMPLING

C-2.1 For judging the conformity of a lot to the requirements of the specification, tests shall be done for each lot separately. For this purpose, the number of PLC terminals to be selected at random from a lot shall be in accordance with col 1 and 2 of Table 2.

TABLE 2 SCALE OF SAMPLING

(*Clauses* C-2.1 *and* C-3.1)

Lot Size	Sample Size	Cumulative Sample Size	Acceptance No.	Rejection No.
(1)	(2)	(3)	(4)	(5)
Up to 20	2*	2	0	2
	2†	4	1	2
21 to 60	4*	4	0	2
	2†	6	1	2

*First sample.
†Second sample.

C-3. NUMBER OF TESTS AND CRITERIA FOR ACCEPTANCE

C-3.1 Each of the PLC terminal sample selected according to col 2 of Table 2 shall be subjected to all the acceptance tests given in Table 1. The lot shall be declared as accepted if the number of defectives found in the first sample is less than or equal to the acceptance number given in col 4 of Table 2; and shall be rejected if it is greater than or equal to the rejection number given in col 5. If the number of defectives is 1, a second sample of the size given in col 2 shall be chosen. The lot shall be declared as accepted if all the samples in the second sample pass.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2